CLAIMS

1) A method of determining the thermal profile of a drilling fluid circulating in a well under drilling, wherein the following stages are carried out :

a) determining a general expression θ1 for the thermal profile of the fluid inside the drill string in the well and a general expression θ2 for a thermal profile of the fluid in the corresponding annulus, using the heat propagation equation that takes into account a thermal profile of the medium surrounding the well,

b) measuring the temperature of the fluid at the well inlet, T1, at the well bottom, T2, and at the well outlet, T3,

c) laying down that expressions θ1 and θ2 meet the temperature boundary conditions T1, T2 and T3.

2) A method as claimed in claim 1 wherein, after stage c), the following stage is carried out :

d) drawing the thermal profile of the drilling fluid as a function of the depth.

3) A method as claimed in claims 1 and 2, wherein stages b), c) and d) are repeated so as to obtain a real-time temperature profile.

4) A method as claimed in any one of claims 1 to 3, wherein :

- in stage a), general expressions θ1 and θ2 comprise unknown constants,
- in stage c), it is laid down that expressions θ1 and θ2 meet the boundary temperature conditions T1, T2 and T3 by determining said unknown constants.

5) A method as claimed in any one of claims 1 to 4 wherein, in stage a), the heat propagation equation taking account of at least the thermal equation of the medium surrounding the well, the flow rate of the fluid and the balance of the thermal exchanges undergone by the fluid is used, said thermal exchanges comprising at least exchanges between the ascending and descending drilling fluid.

6) A method as claimed in any one of claims 1 to 5 wherein, in stage a), the heat propagation equation in a homogeneous medium on a cylinder of infinite height centered on the well is used, said cylinder comprising the drill string that guides the descending fluid and the annulus surrounding said drill string, which guides the ascending fluid.

7) A method as claimed in any one of claims 1 to 6, wherein :

- in stage a), general expressions $\theta 1$ and $\theta 2$ are each split up into several independent equations,
- in stage c), furthermore, it is laid down that the thermal profiles and the derivatives of the thermal profiles of the fluid within the drill string and in the corresponding annulus are continuous.

8) A method as claimed in any one of claims 1 to 5 applied to a vertical offshore well, wherein :

- in stage a), each general expression $\theta 1$ and $\theta 2$ is split up into two independent equations, $\theta 11$ and $\theta 12$, $\theta 21$ and $\theta 22$ respectively, by taking into account the thermal profile of the medium surrounding the well,

- in stage c), furthermore, it is laid down that the thermal profiles and the derivatives of the thermal profiles of the fluid within the drill string and in the corresponding annulus are continuous.

9) Use of the method as claimed in any one of claims 1 to 7 for calculation of the pressure drops of the drilling fluid circulating in a well under drilling.

10) Use of the method as claimed in any one of claims 1 to 7 for calculation of the hydrate formation zones in the fluid during drilling.